



THE TEXAS THUNDERBOLT



National Weather Service - Fort Worth, TX
Serving all of North Texas
www.weather.gov/fortworth

Winter 2012

NWS Fort Worth

Leadership Team

Meteorologist in Charge

Bill Bunting

Science and Operations

Officer

Greg Patrick

Warning Coordination

Meteorologist

Mark Fox

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Questions? Comments?

sr-fwd.webmaster@noaa.gov

What is an Ensemble Forecast?

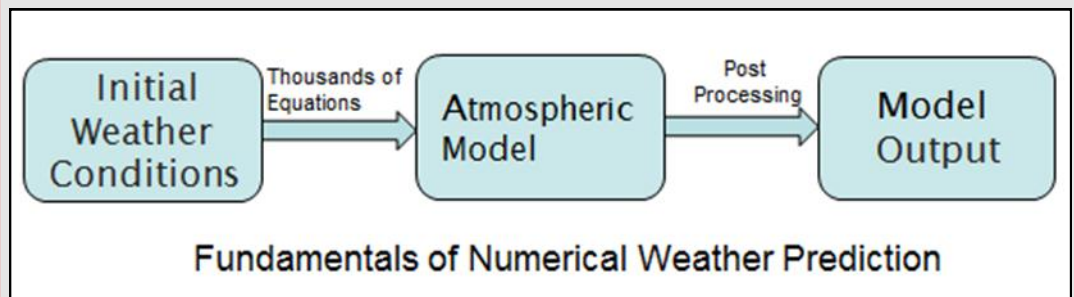
by Greg Patrick

An ensemble forecast is simply a collection of two or more forecasts verifying at the same time. Forecasters have actually been applying the ensemble forecast technique since the 1980s when they compared model output charts from two separate weather forecast models. School children have been known to create an ensemble forecast by watching all available TV weathercasters *and* listen to the forecast on the radio to help discover if the upcoming winter storm would lead to school cancellations. Today, ensemble techniques in a modern Weather Forecast Office are much more complex and are advancing rapidly as computer processing

speeds increase. This article focuses on the concept of using Ensemble Prediction Systems (EPS) as a way to improve forecasts ranging from 3 hours to two weeks.

To explain EPS, let's first examine the fundamental concepts related to Numerical Weather Prediction. The diagram below illustrates those concepts: the initial state of the atmosphere is captured using observed data from all available sources; a complex mathematical model uses the initial conditions to simulate the evolution of the atmosphere in time; the model output is processed and displayed in the form of forecast maps, graphics, and text.

Continued on pg. 5...



The 2012 Spotter Training Season

We are currently offering SKYWARN spotter training classes now through late March 2012 across all of North Texas. Want to know when a spotter training class will be offered in your area? Visit our spotter training schedule online at:

<http://www.srh.noaa.gov/fwd/?n=skywarnmap>

Remember spotter training classes are FREE to the public. No fees or registration are necessary to attend, simply show up at the time and location listed on the schedule above.

Spotter training classes offer training for anyone interested in identifying cloud features associated with severe weather in North Texas. Classes focus on identifying key cloud features, spotter safety and spotter reporting procedures. Classes are typically about 2 hours long with a 10 minute intermission in the middle of the class. Advanced spotter training is also offered at several locations across North Texas.



Co-op Awards by Troy Marshall

50 Years!!

The **Proctor Lake Reservoir** in Comanche County, TX. was presented with a **50 Year Honored Institution Award** by MIC Bill Bunting of the NWS office in Ft. Worth, TX. From right to left are MIC Bill Bunting, Lake Manager Brett Delk, Chief Ranger Mike McBride, and rangers James Thompson and Reagan Haynes. In informal luncheon was also held in their honor. Also attending the award presentation, but not pictured were hydrologist Bob Carle from the NWS office in Ft. Worth and Jerry Cotter and Lynne Rednour from the Corps of Engineers in Ft. Worth.



Glenna L. Picard of Palo Pinto, Texas was presented with a **40 year Length of Service Award** by MIC Bill Bunting, NWS, Fort Worth. An informal luncheon was held at the Mesquite Grill in Mineral Wells, in honor of Mrs. Picard. Pictured to the left with Glenna are her husband Jim, left, and MIC Bill Bunting. Photo was taken by HMT, Troy Marshall.

B.G. Martin (pictured right) of Wills Point, Texas received a **35 year Length of Service Award** from HMT Troy Marshall, NWS, Fort Worth.



...continued on next page...

Co-op Awards Continued...

*Length of
Service
Awards
ranging
from 20 to
50 years!*



W.E. Boyd Jr. of Iredell, Texas received a **30 year Length of Service Award** from HMT Troy Marshall, NWS, Fort Worth. Pictured to the left is Mr. Boyd, along with his wife LaMona.

Patrick Flanigan (pictured to the right) of Nix Store, Texas received a **20 year Length of Service Award** from HMT Troy Marshall, NWS, Fort Worth.



Kenneth Lesley (pictured to the left) of Chalk Mountain, Texas received a **20 year Length of Service Award** from HMT Troy Marshall, NWS, Fort Worth.

...continued on next page...

Co-op Awards Continued...



Monty Smith of Brandon, Texas received a **20 year Length of Service Award** from NWS meteorologist Matt Mosier, NWS, Fort Worth.

*Thanks to all
of our Co-op
Observers for
all of your
hard work,
dedication,
and service!*

Outdoor Warning Sirens by Melissa Huffman

North Texans are no stranger to the sound of “tornado sirens” during severe weather season, but have you ever wondered why they have been activated in your area when there is no tornado? In North Texas, the term “tornado siren” is actually a misnomer for the sirens you hear during severe weather. Called “outdoor warning sirens”, they can be activated by local emergency management officials in any emergency situation... not just for tornadoes.

Outdoor warning sirens are meant to notify people **outdoors** to go inside and seek additional information about the hazards in their area. Outdoor warning sirens are not designed to alert people indoors, as the system is designed only for people outdoors. Because of this, outdoor warning sirens should never be used as your primary notification of severe weather. If severe weather is expected to occur in your area, stay informed by listening to your NOAA All-Hazards Weather Radio, checking NWS Fort Worth’s webpage at www.weather.gov/fortworth or Facebook page, or by watching the local news. Other notification

methods may be available through your community’s emergency management officials.

Cities and counties set their own criteria for when sirens are activated, if they have an outdoor warning siren system. These criteria may include strong winds, large hail, and the issuance of a tornado warning from the National Weather Service or the sighting of a tornado by trained spotters. In the event sirens are sounded in your community, keep in mind different community standards for siren activation make it imperative to seek out additional information about hazards in your area.

Currently, there are no regional, state, or national requirements for outdoor warning siren activation. North Texas emergency management officials and the North Central Texas Council of Governments have established recommended guidelines for siren activation. Those guidelines, as well as criteria that some North Texas cities use, are available here: http://www.nctcog.org/ep/Public_education/ows.asp.

North Central Texas Council of Governments Outdoor Warning Siren Activation Guidelines
<p>The National Weather Service issues a Tornado Warning or Severe Thunderstorm Warning with the phrase “Destructive winds in excess of 70 mph (or higher) are likely with this storm” for your immediate area. A community existing in multiple counties should pay close attention to the warning area.</p> <p>Trained storm spotters have reported a tornado in the jurisdiction, or in a neighboring jurisdiction that has the potential to affect your community. (Each community should determine satisfactory methods for verifying tornado activity reports).</p> <p>Reported hail of 1.25” in diameter or greater. (1” may be more appropriate for areas or events where large numbers of people are outdoors)</p> <p>Other emergency as directed by the community’s elected officials.</p>
Source: http://www.nctcog.org/ep/REM/Outdoor_Warning_System_Guidelines.pdf

The CASA Radar Project in North Texas

by Bill Bunting

“...benefits of the CASA Radars... expected to result in more detailed flash flood and severe weather warnings.”

North Texas will soon be the host for an ambitious project designed to test the effectiveness of a network of 8 unique Doppler Radars to benefit public safety. The project, known as the “CASA DFW Urban Demonstration” will test the multi-radar system developed by CASA, the Collaborative Adaptive Sensing of the Atmosphere consortium. CASA is comprised of four universities (with collaboration involving other schools) that received a 10-year National Science Foundation grant to develop and test the radar system. There are also several private-sector partners working with CASA scientists. Four radars that have been tested in Oklahoma the past five years were recently relocated to a hangar at DFW International Airport to undergo renovations and upgrades. Installation of these four radars in the DFW area will occur early this year. Four additional radars are also planned for installation later in 2012 or early 2013. Once complete, the eight-radar network will provide overlapping coverage throughout

the Dallas-Fort Worth Metroplex and surrounding areas.

The benefits of the CASA Radars will include enhanced sampling of precipitation and winds near the ground, which is expected to result in more detailed flash flood and severe weather warnings. Each radar takes a complete sample of the lower atmosphere every 20 to 60 seconds, and is able to “see” very small-scale features such as downbursts and short-lived areas of rotation clearly. The improved detection of areas of potentially damaging winds will result in more geographically precise Severe Thunderstorm and Tornado Warnings. The CASA radars are also very sensitive to the size and number of raindrops and should therefore lead to improved rainfall estimates and more detailed Flash Flood Warnings.

After the CASA radars are installed, NWS meteorologists at the Fort Worth Weather Forecast Office, West Gulf River Forecast Center, and Center Weather Service Unit near DFW airport will begin evaluating the data and using it for forecast and warning purposes. Plans are also being developed to disseminate the radar information to the broadcast media, emergency managers, businesses, and the public.

To learn more about the CASA Project in general, visit

<http://www.casa.umass.edu>.

To learn more about the CASA DFW Urban Demonstration, visit

<http://www.casa.umass.edu/main/research/urbantestbed/>.



Image: CASA Radars in a hangar at DFW Airport, November, 2011 awaiting system upgrades.

Ensemble Forecasting continued...

Prior to the 1980s, weather forecasters relied largely on output from a single atmospheric model. That concept is referred to as “deterministic” since that single model’s output ‘determines’ the forecast guidance. The limitations of deterministic forecasting are tied to 3 categories of shortcomings of Numerical Weather Prediction: 1) errors and uncertainties exist in the initial conditions; 2) models use atmospheric equations that are often only approximations to the actual atmospheric processes; and 3) atmospheric models cannot resolve or predict weather features that are smaller than certain thresholds. Research, experience, and advancing technology have led to major improvements in each of these 3 sources of forecast error in the past 30 years. However, many meteorologists will agree that one of the biggest single advances in improving Numerical Weather Prediction has been the emerging concept of Ensemble Prediction Systems.

As late as the 1980s, it was too expensive to run multiple models to create an EPS. The models that were available to meteorologists ran on supercomputers, but the processing speeds in the 1980s were a very small fraction of what speeds are today. With faster and cheaper supercomputers, we can now afford to run several EPS several times a day! Most of the EPS data used by forecasters at the NWS in Fort Worth are created on supercomputers at the National Centers for Environmental Prediction in the Washington DC area.

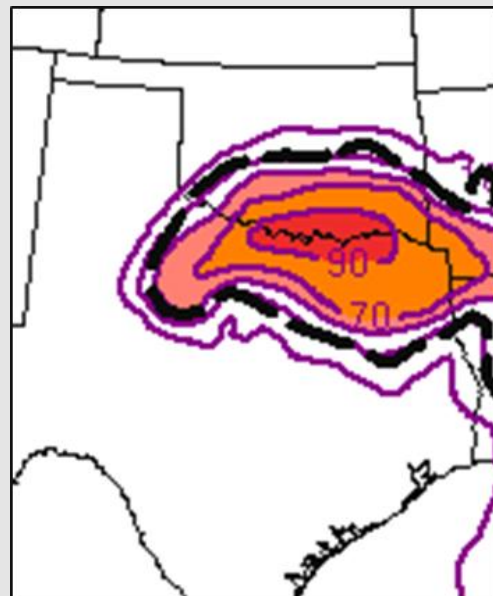
The main idea behind ensemble forecasting is to provide meteorologists with more guidance information that can be used to make a more reliable weather forecast. The attraction and popularity of EPS are tied to the fact that EPS use two methods that address 2 of the 3 main categories of errors in Numerical Weather Prediction models. The first method takes a single set of model equations and runs that set of equations multiple times using ***differing initial conditions***. The second method uses ***multiple sets of model equations*** and runs those sets of equations using the same initial conditions. Most robust EPS use a combination of these two methods to create the ensemble forecast.

The Short Range Ensemble Forecast (SREF) is an EPS that creates forecasts from 3 hours to 3.5 days. Output from the SREF is used almost daily at the NWS in Fort Worth. This EPS consists of 21 total model runs, commonly referred to as “members”, and can be used to give forecasters guidance on temperature, rainfall, snowfall, and precipitation type. An example graphic of forecast probability of 0.10” or more of rain falling in a certain 6-hour period is shown to the right: the contour line labeled ‘70’ encompasses an area that indicates roughly 15 or more of

the 21 members ($15/21 = 71\%$) showed rainfall of 0.10” or more.

The North American Ensemble Forecasting System (NAEFS) is an EPS that uses computer resources of two major modeling centers. The NAEFS is composed of 42 members that create forecasts from 12 hours to 16 days. The National Centers for Environmental Prediction contributes 21 members and the Canadian Meteorological Centre contributes 21 members. The output can be used as forecaster guidance on movement of large scale weather systems after 7 days and can provide automated temperature and precipitation outlooks out to 16 days.

The future of EPS looks bright. Continued rapid advances in computer processing speeds along with updated observing technology such as new weather satellites will benefit ensemble prediction systems. In the future, the use of EPS as forecast guidance may be key in helping NWS forecasters more accurately predict the timing, severity, and likelihood of significant weather events.



SREF probability (in percent) of 0.10” or more precipitation in a 6 hour period.
70% covers parts of north Texas with
90% probability along the Red River.
(image courtesy Storm Prediction Center)

Why do sunrise times get progressive later in early January even though the days keep getting longer?

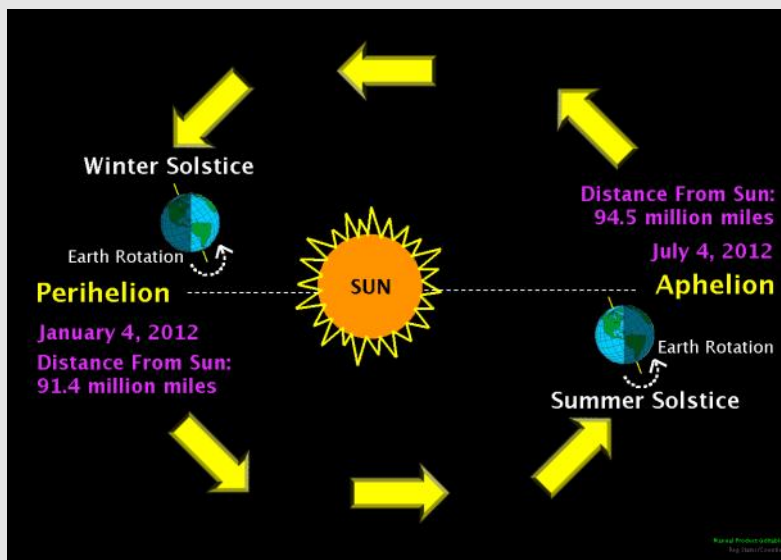
We received a question about sunrise/sunset times. A fan wanted to know why the sunrise time gets progressively later in early January even though the days are growing longer during this time.

It's a great question, but the answer is rather complicated. The shortest day of the year (sunrise to sunset) occurs near the winter solstice in late December, but the latest sunrise (in local standard time) occurs in early January. This is because the earth is actually closest to the sun (perihelion) in early January; this year, perihelion occurred on January 4 (Central time). After perihelion occurs, the earth is moving away from the sun. Because the earth's rotation and its revolution around the sun are both in the same direction (counterclockwise if viewed from above the North Pole), it takes a point on the earth a bit longer to turn toward the sun in the days following perihelion even though the time between sunrise and sunset is increasing. However, soon after perihelion, the

increase in daylight as we head toward the summer solstice is greater than the effect of heading away from the sun, and the time of sunrise begins to get earlier each day. You may also notice that during this time the sunset increases by about a minute per day while the sunrise changes little. This is because sunset incurs the combined effect of both the increasing length of the day and the extra amount of time it takes to turn away from the sun.

The opposite effect happens during the summer. The sunset remains around the same time for a few weeks after the summer solstice while the sunrise gets progressively later.

It's interesting to note that the earth is actually closest to the sun during the northern hemisphere winter (and farthest away during our summer). The seasons are caused by the axial tilt of the earth, not the earth's distance from the sun. Our winters and summers would be more extreme if this were reversed.



The earth rotates counterclockwise around the sun and around its axis (when viewed from above). This causes a drag effect on sunrise and sunset times shortly after the solstices.

A New Era of Drought?

by Dan Huckaby

Drought has always been a part of Texas climate, but drought frequency and duration vary considerably. Analysis of Texas tree ring data suggests that the end of the 20th century was one of the most drought-free periods in the last several hundred years. The abundant rainfall coincided with a dramatic increase in population, a population thirsty for green lawns and swimming pools.

Unfortunately for Texas residents, drought has become more common during the last decade. Although bookended by the floods of 2004 and 2007, the 2005-2006 drought was the most intense dry period, lasting more than a year in duration since the 1950s. Although the current drought appears to have passed its peak, it was even more intense and widespread than the drought a half-decade earlier. Is this a new trend? Are we returning to a drier climate?

These two recent dry periods coincided with La Niña conditions, cooler than normal waters in the equatorial Pacific. Texas precipitation shows a strong correlation with sea surface temperatures, but ENSO phase is only one of the contributing oceanic teleconnections.

The phase of the Pacific Decadal Oscillation (PDO), a variation of sea surface temperatures in the mid-latitudes of the North Pacific, increases the likelihood of a particular ENSO phase (See Figure 1). Unlike ENSO, which generally changes phase every 1 to 3 years, a particular phase of the PDO can dominate for decades. The prolonged La Niña event during the 1950s, which extended the longest drought of the 20th century, coincided with the cold phase of the PDO.

The Atlantic Multidecadal Oscillation (AMO), which is based on sea surface temperature anomalies in the North Atlantic, has an opposite correlation. The warm phase of the AMO (particularly when the warming is enhanced in the mid-latitudes) often coincides with Texas drought. The AMO was in its warm phase during the 1950s drought as well as both of our recent droughts. (See Figure 2.) The current AMO warm phase is expected to continue for at least the next two decades.

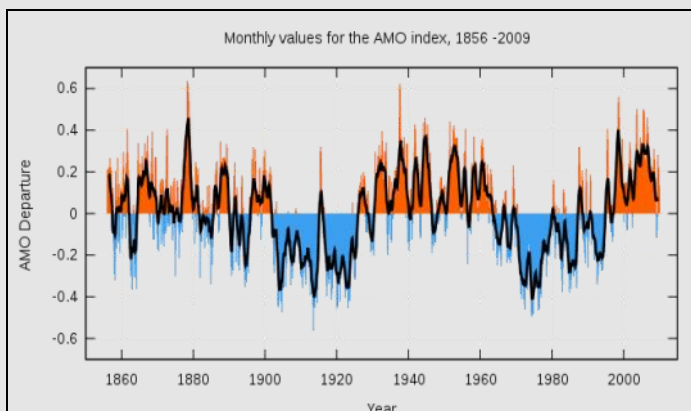
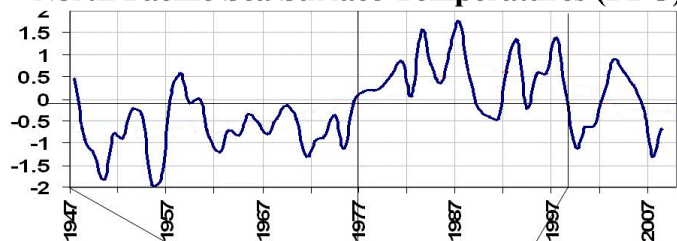


Figure 2 - Values of the Atlantic Multidecadal Oscillation (AMO), which is based on sea surface temperature anomalies in the North Atlantic is shown from the late 1850s through 2010.

North Pacific Sea Surface Temperatures (PDO)



PDO	Cold	Warm	Cold
	1947-1977	1978-1998	1999-2009
El Nino	7	10	3
La Nina	14	3	6

NOAA CDC

Figure 1 - The phase of the Pacific Decadal Oscillation (PDO), a variation of sea surface temperatures in the mid-latitudes of the North Pacific, spanning the 60 year period from 1947 to 2009.

With both the PDO and the AMO entrenched in phases favoring precipitation deficits in Texas, we are likely entering an era more susceptible to drought. The PDO's cold phase also tends to lengthen ENSO's cold phase, evidenced by the current multi-year La Niña. This suggests an enhanced likelihood of prolonged drought. Multi-year droughts did not occur during the last few decades of the 20th century, which were dominated by a warm PDO and a cold AMO. However, multi-year (and even multi-decadal) dry periods are more common in the paleoclimatic (prehistoric climate) record than prolonged periods without them. This paints a harrowing outlook, but if we are able to anticipate the likelihood of drought, we may be better prepared to mitigate its impacts.

For more information on the ongoing drought impacting North Texas, visit weather.gov/fortworth/?n=drought

**National Weather
Service - Fort Worth, TX**

3401 Northern Cross Blvd.

Forth Worth, TX 76137

Phone: 817-429-2631

E-mail:

sr-fwd.webmaster@noaa.gov

**"Protecting Life and
Property Across North
Texas."**



Thank you to all of the contributors to the Winter 2012 edition of The Texas Thunderbolt. Look for the Summer 2012 edition of The Texas Thunderbolt to become available in the early summer of 2012.

Thunderbolt Editors:

Amber Elliott

Dennis Cavanaugh

Thunderbolt Publishing:

Lance Bucklew

*Visit us on the web!
weather.gov/fwd*

Find NWS Fort Worth on Facebook!

On October 6th, 2010, the Fort Worth Weather Forecast Office (WFO) was the first National Weather Service WFO to go live with a facebook page. The direct link to our facebook page is: www.facebook.com/US.NationalWeatherService.FortWorth.gov

Facebook users can also type in "National Weather Service Fort Worth" into the facebook page search bar to find our page.

Facebook offers us another way to communicate weather information to residents of North Texas and anyone else with an interest in our local area weather. Our office facebook page offers us the opportunity to provide specific details on upcoming weather events and directly interact with customers to add value or clarification to the forecasts that we issue.



Ask Dr. Weather!

If you are interested in the weather and have always wanted to have something weather-related explained, submit us your question! For the next issue of the Texas Thunderbolt, Dr. Weather will answer one of your submitted questions in a full length article. To submit your question, please send an email to sr-fwd.webmaster@noaa.gov.

The most recent Dr. Weather topics include: Snow Development, Frost, Microbursts, Landspouts, and Hurricanes & Wind Shear. Send us your question and whether you'd like your name and location included in the article and your question may be featured in the next installment of Dr. Weather's Wisdom!

Previous issues of the Texas Thunderbolt can always be found at

<http://www.srh.noaa.gov/fwd/?n=skywarn>